SYSTEM FOR GENERATING, DISTRIBUTING AND RECEIVING AN INTERACTIVE USER INTERFACE

This application claims benefit of U.S. Provisional patent application serial number 60/093,891 filed July 23, 1998 and 60/129,598 filed April 15, 1999, which are hereby incorporated herein by reference in their entirety.

This application is also a continuation-in-part of U.S. Patent Applications serial number 09/293,526 filed April 15, 1999, which is hereby incorporated herein by reference in its entirety.

BACKGROUND OF THE DISCLOSURE

1. Field of the Invention

The invention relates to communications systems in general and, more specifically, the invention relates to an interactive user interface suitable for use in an interactive multimedia information delivery system.

2. Description of the Background Art

Over the past few years, the television industry has seen a transformation in a variety of techniques by which its programming is distributed to consumers. Cable television systems are doubling or even tripling system bandwidth with the migration to hybrid fiber coax (HFC) cable plant. Customers unwilling to subscribe to local cable systems have switched in high numbers to direct broadcast satellite (DBS) systems. And, a variety of other approaches have been attempted focusing primarily on high bandwidth digital technologies, intelligent two way set top boxes, or other methods of trying to offer service differentiated from standard cable and over the air broadcast systems.

With this increase in bandwidth, the number of programming choices has also increased. Leveraging off the availability of more intelligent set top boxes, several companies such as Starsight® and Prevue™ Guide have developed elaborate systems for providing an interactive listing of a vast array of channel offerings, expanded textual information about individual programs, the ability to look forward to plan television viewing as much as several weeks in advance, and the option of automatically programming a VCR to record a future broadcast of a television program.

Unfortunately, the existing program guides have several drawbacks. They tend to require a significant amount of memory, some of them needing upwards of one megabyte of memory at the set top terminal (STT). They are very slow to acquire their current database of programming information when they are turned on for the first time or are subsequently restarted (e.g., a large database may be downloaded to a STT using only a vertical blanking interval (VBI) data insertion technique). Disadvantageously, such slow database acquisition may result in out of date database information or, in the case of a pay per view (PPV) or video on demand (VOD) system, limited scheduling flexibility for the information provider. Furthermore, the user interface of existing program guides do not usually look like a typical television control interface; rather the user interface looks like a 1980's style computer display (i.e., blocky, ill-formed text and/or graphics).

Therefore, it is seen to be desirable to provide an interactive program guide in a manner tending to reduce the above-described problems.

SUMMARY OF THE INVENTION

The invention is an information distribution system comprising a head end wherein a user interface is generated as a digital bitstream, a distribution network for transmitting the user interface to viewers, and subscriber equipment for receiving the user interface and producing a display containing the user interface. The user interface is illustratively embodied in an interactive program guide (IPG).

More specifically, the user interface comprises a graphical region and a video region. In the illustrative IPG embodiment, the graphical region contains a time axis and a channel axis. Certain programming information, for example, program titles are aligned with the axes to form a grid-like pattern that enables a viewer to rapidly comprehend the identity of a program, the time that it is to be broadcast and the channel upon which the program can be found. The IPG further comprises a video region that produces a video image and sound for advertisements of goods and services, previews of programming, and the like. Additionally, the IPG may contain a text region that displays text related to a selected program or other object in the graphics region. Such text may include a description of the selected program, the duration of the program, the actors/actresses in the program, and the like.

The user interfaces may be produced as a plurality of individual interrelated interfaces that enable the viewer to seamlessly move from interface to interface.

Selecting various objects within the interface initiates various information distribution sessions referred to herein as "contexts". For example, a user may initiate a video-on-demand (VOD) context by selecting a VOD button. Similarly, the user may initiate a broadcast television session by selecting a program title in the

program guide graphical region of the interface. Or, a preview context may be initiated if the user selects a program title that is listed as being available in the future.

BRIEF DESCRIPTION OF THE DRAWINGS

The teachings of the present invention can be readily understood by considering the following detailed description in conjunction with the accompanying drawings, in which:

FIG. 1 depicts a block diagram of an illustrative interactive information distribution system that can benefit from the interactive user interface of the present invention;

FIG. 2 depicts a block diagram of subscriber equipment suitable for use in an interactive information distribution system;

FIG. 3A-3C depict a first embodiment of an interactive user interface;

FIG. 4 depicts the first embodiment of the interactive user interface while emphasizing a new time slot;

FIGs. 5A-5C depicts a flow diagram of a process for moving from one object to another in the first embodiment of the interactive user interface;

FIGs.6A-6C depict a second embodiment of an interactive user interface;

FIGs. 7A-7B depict a flow diagram of a user interaction routine;

FIG. 8 is a third embodiment of an interactive user interface;

FIG. 9 depicts a system stream and its constituent transport streams;

FIG. 10 depicts one example of a program guide layout;

FIG. 11 depicts a second example of a program guide layout; and

FIG. 12 is a table of functional descriptions of keys on an input device that can be used to control the system of the present invention.

To facilitate understanding, identical reference numerals have been used, where possible, to designate identical elements that are common to the figures.

DETAILED DESCRIPTION

This invention is a system for generating, distributing and receiving a unique user interface that is illustratively embodied in an interactive program guide that enables a user to interactively review, preview and select programming for a television system.

Fig. 1 illustrates a high-level block diagram of an information distribution system 100 that generates an interactive user interface in accordance with the present invention. The system 100 comprises a head end 102, a distribution network 104, and a user terminal 106 (commonly referred to as a set top terminal (STT) or set top box, although the terminal may be embedded into a user's television or other video display equipment). For simplicity, the diagram shows a single head-end 102 and a single STT 106, while it is possible to combine multiple head-end systems to provide a desired functionality for the overall system. In a practical application, there are multiple STTs 106 coupled to the network 104 to enable a plurality of users to receive information from the head end 102.

The distribution network 104 is generally a high bandwidth, full duplex communications network, such as a hybrid fiber-coax network. However, the network 104 may

comprise multiple simplex communications channels where together the simplex channels provide bi-directional communications between the head end and the STT, e.g., a forward channel could carry information from the head end to the STT through a cable system, while a back channel could carry information from the STT to the head end via a telephone system.

The head-end 102, which carries the most user-interface-related processing power and storage capability, comprises a user interface graphics generation/storage unit 108, video source 110, compositor 112, encoding unit 114, multiplexer 116, video modulator 118, a video session manager (VSM) 120 or multiple VSM' s depending on the viewer/subscriber load, and a video server 122. The IPG generation and encoding apparatus is disclosed in further detail within commonly assigned US patent application _____ (Attorney docket number 168 CIP1), filed simultaneously herewith and incorporated herein by reference.

The VSM 120 performs the command and control functionality and operates as a bridge between the user interface graphics generation/storage unit 108 and the STTs (one of which is depicted as STT 106), being responsible from the establishment and maintenance of the head end-to-STT communication. Specifically, the VSM controls user interface transmission to the STT and controls the response of the system to user requests that are made through the user interface. As shall be described in detail below, the user interface that is transmitted as a digital video bitstream can be used to control and request video and other information from the information server 122. The information server 122 interacts with the VSM 120 to produce requested information for transmission to a particular STT 106, to all the STTs or a particular subset of STTs.

As shall be discussed in detail below, the user interface comprises both graphical information and video information under the control of the VSM 120. The video information for the user interface is produced by the video source 110 (or sources). The graphical information for the user interface is produced in the user interface graphics generation/storage unit 108. The unit 108 comprises a graphics storage unit 124, a graphics server 126 and a graphics formatter 128. The graphics server 126 recalls the graphics information from the storage unit 124 and has the recalled information formatted in the graphics formatter 128 such that the graphics are in an appropriate format for use in a user interface. The server 126 sends a bitmap containing the graphical information for a user interface to the compositor 112.

The compositor combines the graphics with the video to produce a composite video frame sequence. The frame sequence is then encoded within the encoding unit 114. The encoding unit 114 comprises a plurality of real-time MPEG encoders 130_1, 130_2, ... 130_n (where n is an integer). The encoding unit 114 also comprises an audio encoder 132 that encodes the audio information associated with the video source signal.

The compositor 112 produces a plurality of frame sequences containing graphics and video. For example, to produce interrelated user interfaces, the video is the same in each sequence, but the graphics are different. Each of these sequences is encoded using, for example, a real-time encoder that produces an MPEG compliant bitstream. Each of the bitstreams are coupled to the multiplexer 116 to form one or more transport streams, for example, MPEG compliant transport streams. Each of the encoded user interfaces are identified in the transport streams using a unique identifier, e.g., a program identifier (PID) code. As such, the STT 106 can select a particular user

interface for display by selecting the identifier, e.g., selecting a PID. Once encoded and multiplexed, the transport stream or streams are then coupled to the digital video modulator 118 (e.g., a quadrature amplitude modulation (QAM) modulator) for transmission through the distribution network 104 to the STT 106.

All the encoded bitstreams are temporally aligned in terms of data (i.e., streams depicting different channels or different times are aligned such that stream to stream switching at a decoder may be accomplished in a substantially seamless manner). In addition, the streams are generated in a synchronized manner with respect to clock source, such that GOP structures, sequence headers, I-picture location and other parameters are (if desired) aligned across a plurality of information streams. In this manner, stream splicing may be performed without noticeable video artifacts or audio artifacts, and without excessive latency.

FIG. 9 depicts a diagrammatic representation of a multiple program transport stream suitable for use in the interactive information distribution system of FIG. 1. Specifically, FIG. 9 depicts a diagrammatic representation of a system stream 910 and its constituent multiple transport streams 920.

The system stream 910 comprises, illustratively, a quadrature amplitude modulation (QAM) system stream conveyed by a forward channel within the information distribution system. Specifically, the system stream 910 comprises a plurality of transport streams 920, including transport streams A-H (911-917). Each of the transport streams include at least one of video, audio or data elementary streams or packetized elementary streams (PES). Each elementary stream within the system stream 910 has associated with it a unique packet identification (PID) number.

The transport stream 920 comprises an exemplary plurality of elementary streams associated with a first transport stream 911 (denoted as stream A) and a second transport stream 912 (denoted as stream B). Specifically, first transport stream 911 (i.e., stream A) comprises five elementary streams (921-925), each of which has associated with it a respective PID. The five elementary streams (921-925) of stream A are used to provide video, audio and graphics/data information to a set top terminal such that the set top terminal is capable of producing, via a display device, an IPG display.

In the exemplary embodiment of the invention, the system stream 910 comprises a constant bitrate stream having a bitrate of 3.37125 million bits per second (Mbps), each video PES has a bitrate of 1.05 Mbps, each audio PES has a bitrate of 192 Kbps (44.1kHz audio) or 224 Kbps (44kHz audio) while the remaining bandwidth is utilized by data streams, overhead and the like. It will be appreciated by those skilled in the art that the bitrate of any of these streams may be adapted to, e.g., provide minimum video and/or audio quality levels, provide maximum video and/or audio quality levels, to provide for a maximum number of video and/or audio elementary streams within a transport stream and other system design criteria. The exemplary bitrates are only provided to give a sense of the bandwidth utilization of a presently employed system utilizing the teachings of the invention. The actual bitrates will increase or decrease as the system is upgraded and the like.

The first video stream (PID 1) comprises all the information necessary to produce a video layer for the IPG display, including channel content objects associated with a first group of channels for a defined time period. The second video stream (PID 2) and third video stream (PID 3) differ from the first video stream (PID 1) in that the

second video stream (PID 2) and third video stream (PID 3) comprise the information necessary to produce a video layer including second and third groups of channels.

The audio stream (PID 4) comprises the audio information necessary to produce audio associated with video in the IPG.

The data/graphics stream (PID 5) comprises the title description information that is displayed as a program description object. That is, data/graphics stream (PID 5) comprises a textual description of each title provided by a first group of channels for each of the displayed time slots (e.g., three half hour slots). The textual description of the titles is processed by the graphics processing elements of the STT such that the textual description of a presently highlighted or emphasized title of an indicated channel is presented to a viewer via the graphics layer of the IPG display.

It is important to note that graphics and/or data information may be conveyed to a set top terminal using a data stream associated with a unique PID (as depicted here), as private data within the adaptation headers of the transports stream packets or by other means (e.g., encoded within the video data using, e.g., watermarking techniques). Moreover, since the data stream is used to convey program identification data or other data that does not need to be provided in real time, such data may be used to build a local database of, e.g., favorite programming and the like. However, the favorite programming database does not comprise a program guide database. Rather, the favorite programming database comprises sufficient information to identify the favorite program or title, illustratively, the transport stream and video PID providing the appropriate channel group, an index into the channel group (e.g., third channel from start), an index into the time slots (e.g., second time

slot) and the like. There is no need to store the actual title of the program, only to determine which titles should be highlighted or emphasized in a favorite viewing mode.

If the video in each IPG page has differing amounts of motion, the encoders can encode the video in a slice-based manner. As such, each frame is divided into a plurality of horizontal stripes of macroblocks. Each frame contains stripe start and stop identifiers. The information (pixels and/or macroblocks) between the start and stop indentifiers can be encoded in a different manner than other portions of a given stripe. Consequently, a two dimensional region comprising portions of adjacent stripes can be encoded differently from other portions of the frame. The encoded information from the two dimensional region forms a bitstream that is identified by its own program identifier. At the subscriber equipment, the demodulator/decoder decodes the information in each slice, then reassembles the frame by placing the decoded slices into appropriate locations as identified by the slice start/stop identifiers. The two dimensional regions can be specified to align with the informational video such that the regions can contain video having different motion, i.e., fast versus slow motion. Consequently, one region could contain a slow moving animated character while another region could contain a fast moving sporting event promotion and both regions would be coded and decoded accurately.

FIG. 2 depicts a block diagram of the STT 106 suitable for use in producing a display of a user interface in accordance with the present invention. The STT 106 comprises a tuner 210, a demodulator 220, a transport demultiplexer 230, an audio decoder 240, a video decoder 250, an on-screen display processor (OSD) 260, a frame store memory 262, a video compositor 290 and a

controller 270. User interaction is provided via a remote control unit 280. Tuner 210 receives, e.g., a radio frequency (RF) signal comprising, for example, a plurality of quadrature amplitude modulated (QAM) information signals from a downstream (forward) channel. Tuner 210, in response to a control signal TUNE, tunes a particular one of the QAM information signals to produce an intermediate frequency (IF) information signal. Demodulator 220 receives and demodulates the intermediate frequency QAM information signal to produce an information stream, illustratively an MPEG transport stream. The MPEG transport stream is coupled to a transport stream demultiplexer 230.

Transport stream demultiplexer 230, in response to a control signal TD produced by controller 270, demultiplexes (i.e., extracts) an audio information stream A and a video information stream V. The audio information stream A is coupled to audio decoder 240, which decodes the audio information stream and presents the decoded audio information stream to an audio processor (not shown) for subsequent presentation. The video stream V is coupled to the video decoder 250, which decodes the compressed video stream V to produce an uncompressed video stream VD that is coupled to the video compositor 290. OSD 260, in response to a control signal OSD produced by controller 270, produces a graphical overlay signal VOSD that is coupled to the video compositor 290. During transitions between bitstreams representing the user interfaces, a buffer in the decoder is not reset (flushed). As such, the user interfaces seamlessly transition from one screen to another.

The video compositor 290 merges the graphical overlay signal VOSD and the uncompressed video stream VD to produce a modified video stream (i.e., the underlying video images with the graphical overlay) that is coupled

to the frame store unit 262. The frame store unit 262 stores the modified video stream on a frame-by-frame basis according to the frame rate of the video stream. Frame store unit 262 provides the stored video frames to a video processor (not shown) for subsequent processing and presentation on a display device. The frame store unit 262, in response to a control signal F produce by the controller 270, "freezes" in memory (i.e., does not update) a presently stored video frame such that the video information provided to the video process results in a still image. This is useful when, e.g., a user interface utilizes scrolling information, a telephone number or address is briefly displayed or a user simply wants to view a presently displayed frame for a longer period of time.

Controller 270 comprises a microprocessor 272, an input/output module 274, a memory 276, an infrared (IR) receiver 275 and support circuitry 278. The microprocessor 272 cooperates with conventional support circuitry 278 such as power supplies, clock circuits, cache memory and the like as well as circuits that assist in executing the software routines that are stored in memory 276. The controller 270 also contains input/output circuitry 274 that forms an interface between the controller 270 and the tuner 210, the transport demultiplexer 230, the onscreen display unit 260, the back channel modulator 295, and the remote control unit 280. Although the controller 270 is depicted as a general purpose computer that is programmed to perform specific interactive program guide control function in accordance with the present invention, the invention can be implemented in hardware as an application specific integrated circuit (ASIC). As such, the process steps described herein are intended to be broadly interpreted as

being equivalently performed by software, hardware, or a combination thereof.

In the exemplary embodiment of FIG. 2, the remote control unit 280 comprises an 8-position joy stick, a numeric pad, a "select" key, a "freeze" key and a "return" key. User manipulations of the joy stick or keys of the remote control device are transmitted to a controller via an infra red (IR) link. The controller 270 is responsive to such user manipulations and executes appropriate user interaction routines 300, uses particular dynamic overlays that are available in a dynamic overlay storage 276-2 and uses particular static overlays form a static overlay storage 276-1.

FIGs. 3A-3C depict an illustrative embodiment of a user interface that contains program guide information, i.e., the interface forms an interactive program guide for television systems. This program guide is created entirely in the head end of the information distribution system of FIG. 1 and transmitted to the user's STT for decoding and display. An OSD graphics layer is either stored in the STT or transmitted with the user interface to facilitate a mask and reveal function that provides a technique to emphasize, highlight, mask, or otherwise identify objects (graphical icons and/or text) within the user interface.

Synchronization of objects contained in the user interface with areas of on-screen emphasis is achieved by using bitmap overlay graphics. The overlay graphics are delivered to the STT through in-band data delivery, out-of-band data delivery, vertical blanking interval (VBI) data delivery or other approaches known to those familiar in the art of data delivery in broadband networks. That is, data necessary to implement manipulable screen objects (i.e., those objects that may be selectively emphasized) is provided to the STT via one or more techniques.

Since the overlays can be dynamically transmitted to the STT, the inventive user interface does not require the maintenance of television programming lists in the set top box, it adds a level of interactivity to current broadcast programming guides, it provides a more television-like user experience, and it makes the best economic use of bandwidth in intricate, asset-rich interactive program guides.

In one embodiment of the invention, multiplexed broadcast analog or digital video and static, pre-programmed bitmaps are utilized. In this embodiment, the pre-programmed bitmaps are installed in the STT in, e.g., memory module 276. The bitmaps are x-y grid borders that align with x-y grid borders built into the broadcast video streams, and are modified in color and/or degree of transparency to allow visual emphasis to be associated with a single objects or set of objects.

In another embodiment of the invention, multiplexed broadcast analog or digital video and dynamic, pre-programmed bitmaps are utilized. In this embodiment, a variety of pre-programmed bitmaps are installed in STT. These bitmaps may be x-y grid borders, circles, or any other delineator capable of providing adequate emphasis so that a user may discern the option of set of options representing an actionable field. These may align with borders built into the broadcast video streams and are modified in color and/or degree of transparency to allow visual emphasis to be associated with a single object or set of objects. The STT can move back and forth between one set of bitmaps and another. Synchronization of a particular set of installed bitmaps to a broadcast video stream is achieved through signaling linked to the broadcast video stream either through in-band data delivery, out-of-band data delivery, vertical blanking interval data delivery or other approaches known to those

familiar in the art of data delivery in broadband networks.

In another embodiment of the invention, multiplexed broadcast analog or digital video and dynamic, updateable bitmaps are used. In this embodiment, a variety of pre-programmed bitmaps may or may not be installed in the STT. As in the previous embodiment, these bitmaps may be x-y grid borders, circles, or any other delineator capable of providing adequate emphasis so that a user may discern the option of set or options representing an actionable field. These may align with borders built into the broadcast video streams and are modified in color and/or degree of transparency to allow visual emphasis to be associated with a single object or set of objects. The STT can move back and forth between one set of bitmaps and another. Synchronization of a particular set of installed bitmaps to a broadcast video stream and download of new bitmaps is achieved through signaling linked to the broadcast video stream either through in-band data delivery, out-of-band data delivery, vertical blanking interval data delivery or other approaches known to those familiar in the art of data delivery in broadband networks.

This system can further be extended to implement conditional access by arranging bitmap information in different data blocks according to types of access allowed. Processing of this information would be performed at the head end where a series of descriptors are developed for each on-screen area capable of receiving emphasis. Part of the descriptors contain entitlement "locks" mapping access entitlement to on-screen areas capable of displaying emphasis. At the STT, a series of "keys" exist that map to those channels the user is entitled to view. If one of the keys "fits" any of the locks, the bitmap set linked to the key may receive on-screen emphasis at the STT. Otherwise, the "unavailable"

titles are de-emphasized such that available titles are clearly differentiated from those titles that are not available.

The IPG display 300A of FIG. 3A comprises a first 305A, second 305B and third 305C time slot object, a plurality of channel content objects 310-1 through 310-8, a pair of channel indicator icons 341A, 341B, a video barker 320 (and associated audio barker), a cable system or provider logo 315, a program description region 350, a day of the week identification object 331, a time of day object 339, a next time slot icon 334, a temporal increment/decrement object 332, a "favorites" filter object 335, a "movies" filter object 336, a "kids" (i.e., juvenile) programming filter icon 337, a "sports" programming filter object 338 and a VOD programming icon 333. It should be noted that the day of the week object 331 and next time slot icon 334 may comprise independent objects (as depicted in FIG. 3A) or may be considered together as parts of a combined object.

Additionally, to better understand the invention, FIGS. 3A-3C depict respective display screens of the interactive program guide (IPG) of the guide of FIG. 3A with various objects (icons and/or text) emphasized.

The interactive program guide display 300A comprises a "video layer" and a "graphics layer". In this context, the "video layer" comprises the imagery from the decoded digital video bitstream containing the video and graphical information of the user interface. As described above with respect to FIG. 1, video information, representative of each of the objects (icons and text), is generated at the head end of the system, and transmitted as part of a video stream. Thus, the actual display parameters (i.e., the size, shape, color, position and other visual parameters) associated with each object are entirely controlled at the head end.

The modifiable, via viewer interaction, objects (icons and text) are selected by, for example, a remote control device associated with the STT. Selecting the screen objects causes a locally stored and/or locally generated graphical overlay to identify the selected objects on the screen by associating each manipulable object or element with a corresponding graphical overlay element (e.g., an x-y coordinate box or other element). An overlay element is selectively emphasized or de-emphasized (e.g., selectively shading, highlighting, coloring and the like) via manipulation of the remote control unit.

The IPG display 300A of FIG. 3A is logically divided into two operational regions; a guide region (the graphical region) 302 and an image region (the video region) 304. The guide region 302 comprises the time slot objects 305, channel content objects 310-1 through 310-8 and channel indicator icons 341A, 341B. Channel options that are listed in the guide region can represent any combination of programming offered from a wide range of sources, including but not limited to, over-the-air broadcast, cable broadcast, satellite broadcast, local programming, ad insertion apparatus and can include the full range of pay channels, pay per view, video on demand, near video on demand, internet service, interactive gaming, interactive shopping, free programming, etc. Channel numbers can be virtual in nature, and they can be remapped in either the set top box or the head end equipment to correspond to the service being delivered.

Delivery of pay per view (PPV), near video on demand (NVOD), video on demand (VOD), interactive gaming, interactive shopping, internet, video classified ads, and other services can be integrated into this system in a two-way cable environment through the use of cable modem technologies or other back-channel methods known to those

familiar in the art of enabling such services in a network environment. This guide region may further be used to provide access to pay television services such as subscription services like HBO®, Showtime®, etc., in a two-way cable environment through the use of cable modem technologies or other back-channel methods known to those familiar in the art of enabling such services in a network environment.

The image region 304 comprises the remaining objects that are delineated above. When a user or viewer is interacting with the program guide of the present invention, only one of these two regions will be active at any one time. Some keys or controls utilized by a viewer to control the IPG will operate differently, depending upon which region is active. The operational differences between the two regions will be described in more detail below.

Referring to the guide region 302 of FIG. 3A, it can be seen that the first time slot 305A is emphasized by a time slot highlighting object 305H. The slot 305A is emphasized with respect to the other time slots 305B and 305C, which can be said to be de-emphasized. The slot 305A can be emphasized by highlighting the slot using a colored highlighting overlay graphic 305H, or the highlighting graphic may provide a 0% opacity window (a transparent window) through which the slot text 305A can be seen and the others slots may be overlaid with a graphic having an opacity that is more than 0%, e.g., 25, 50 or 75 percent opacity. The level of opacity is selected to facilitate clear emphasis of the selected time slot by muting the intensity of the un-selected slots. Similarly, it can be seen that each respective first title object 311A of each of the plurality of channel content objects 310-1 through 310-8 is also emphasized or

highlighted by a title highlighting object 311H. Time slot emphasis is coordinated with title slot emphasis. That is, if the first time slot object 305A is emphasized or highlighted, then the first title object 311A of each of the plurality of channel content objects 310-1 through 310-8 is also emphasized or highlighted. Similarly, if the second time slot object 305B is emphasized or highlighted as in FIG. 3B, then the second title object 311B of each of the plurality of channel content objects 310-1 through 310-8 is also emphasized or highlighted. Lastly, if the third time slot 305C is emphasized as shown in FIG 3C, then the third title objects 311C are emphasized or highlighted. This coordinated highlighting or emphasizing of time slot 305 and title 311 objects assists the viewer in determining which titles within the respective channel content objects 310-1 through 310-8 are associated with which time slot.

Alternatively, the coordinated emphasis or highlighting of time slot and title objects is accomplished by using the graphics layer to adjust a color, brightness or other attributes of an object, or display area surrounding the object. For example, an x-y coordinate grid (a rectangular cell) or other shape surrounding an object to be highlighted or emphasized may be changed in color or brightness level such that the surrounded or proximate object is emphasized. Similarly, an x-y coordinate grid or other shape surrounding an object to be non-highlighted or de-emphasized may be changed in color or brightness level such that the surrounded or proximate object is de-emphasized.

In a system comprising 80 channels of information, where channels are displayed in 8-channel groups having associated with them three half hour time slots, it is necessary to provide 10 video PIDs to carry the present-time channel/time/title information, one audio PID to

carry the audio barker and/or a data PID (or other data transport method) to carry the program description data, overlay data and the like. To broadcast program information up to 24 hours in advance, it is necessary to provide 128 (8*24/1.5) video PIDS, along with one audio and, optionally, one or more data PIDs. The amount of time provided for in broadcast video PIDs for the given channel groups comprises the time depth of the program guide, while the number of channels available through the guide (compared to the number of channels in the system) provides the channel depth of the program guide. In a system providing only half of the available channels via broadcast video PIDs, the channel depth is said to be 50%. In a system providing 12 hours of time slot "look-ahead," the time depth is said to be 12 hours. In a system providing 16 hours of time slot "look-ahead" and 4 hours of time slot "look-back," the time depth is said to be +16/-4 hours.

The program description region 350 of the image region 304 is used to display a description of a presently indicated (emphasized) title. The description comprises, illustratively, one or more of a brief textual description of the title, title start and end times, title run time, title ratings (e.g., MPAA or other ratings), title reviews (e.g., "thumbs-up" or "thumbs-down" or other qualitative indicia), ranking of title in comparison to other titles (e.g., popularity, aggregated positive or negative viewer feedback) and the like.

The pair of channel indicator icons 341A, 341B (or a single channel indicator icons 341A or 341B) is used to indicate which of the plurality of channel content objects 310-1 through 310-8 includes a highlighted or emphasized title object 311 having associated with it title description within the program description icon 350. That is, the channel indicator icons 341A, 341B provide a

visual indication of a presently indicated channel to the viewer.

It is important to note that the video barker 320 of FIG. 3A is, itself, an object that may be selected in some embodiments of the invention. Specifically, in such an embodiment where the video barker 320 is used to present a movie trailer, selection of the video barker object 320 by the user implies a desire to view that movie in, e.g., a video-on-demand context. Thus, in an embodiment of the invention where the video barker comprises an active or selectable object, selection of the video barker brings the user to a video-on-demand interaction screen where the user is provided the opportunity to purchase the movie presented in the video barker. Similarly, where the video barker is used to present merchandise or other products and/or services for sale, selection of the video barker results in the user being brought to an interaction screen suitable for fulfilling a user's desire to purchase or shop for such goods and/or services (e.g., an advertisement from a store is associated with a virtual mall, an advertisement for a restaurant is associated with a food coupon retrieval system, either virtual or via regular mail after entering a name and address).

Referring to FIG. 3B the second channel 310-2, which is indicated by the channel icons 341A and 341B, includes a second title 311B that is associated with the highlighted or emphasized second time slot 305B. In one embodiment of the invention, selecting this title (i.e., pressing the "select" key when the guide region is active) which is to be presented in the future, results in the user being transferred to a preview screen depicting a preview of the selected title. For example, in the case of the selected title being a television sitcom to be broadcast in, e.g., 20 minutes from the present time, selecting that title results in the display of a preview

information screen related to the sitcom. Similarly, in the case of the selected title being a boxing match or other sporting event, usually associated with a pre-game show or pre-fight program of some sort on one or more channels, the user is displayed a screen in which he or she may select which of these pre-event programs to view. Alternatively, the viewer is displayed a screen describing the upcoming fight.

When the guide region 302 is active, user manipulations of left or right arrow keys on, e.g., a remote control device, result in a change in the highlighted or emphasized time slot; while user manipulations of up or down arrow keys result in a change in the indicated channel. In the case of a change in time slot or channel indication, contents of the title description information, which is displayed in the program description region 350, is also changed. The guide region 302 becomes inactive and the image region 304 becomes active when the user utilizes the left or right arrow keys to highlight or emphasize an object within the image region (i.e., icons 331-339).

As noted above, the video streams for the IPG display may be included as a PES within a single transport stream. Thus, a user desiring to view the next 1.5 hour time interval (e.g., 9:30 - 11:00) may activate a "scroll right" object (or move the joystick to the right when a program within program grid 302 occupies the final displayed time interval). Such activation will result in the controller of the STT noting that a new time interval is desired. The video stream corresponding to the new time interval will then be decoded and displayed. If the corresponding video stream is within the same transport stream (i.e., a new PID), then the stream will be immediately decoded and presented. If the corresponding video stream is within a different transport stream, then

the different transport stream will be extracted from the broadcast stream and the appropriate video stream will be decoded and presented. If the corresponding transport stream is within a different broadcast stream, then the different broadcast stream will be tuned, the different transport stream will be extracted from the different broadcast stream and the appropriate video stream will be decoded and presented.

It is important to note that each extracted video stream is associated with a common audio stream. Thus, the video/audio barker function of the program guide is continuously provided, regardless of the selected video stream.

Similarly, a user interaction resulting in a prior time interval or a different set of channels results in the retrieval and presentation of an appropriate video stream. If the appropriate video stream is not normally part of the broadcast video streams, then a pointcast session is initiated. That is, the STT sends a request to the head end via the back channel requesting a particular stream. The head end processes the request, retrieves the appropriate stream from the information server, incorporates the stream within a transport stream as a video PID (ideally the transport stream currently being tuned/selected by the STT) and informs the STT which PID should be demultiplexed, and from which transport stream it should be demultiplexed. The STT then retrieves the appropriate video PID. In the case of the appropriate video PID being within a different transport stream, the STT must first demultiplex the different transport stream (possibly even tuning a different QAM stream within the forward channel).

Upon completion of the viewing of the appropriate stream, the STT indicates to the head end that the STT no

longer needs the stream, whereupon the head end tears down the pointcast session.

FIG. 4 shows an IPG display 400 illustrating the user interface in the next time slot, which is 9:30 to 11:00 PM. The next time slot object 334 in FIG. 3A indicates 9:30 PM as each time slot in the exemplary embodiment comprises one and a half hour time interval. Upon viewer selection of object 334 in FIG. 3A, the time slot in the guide region 302 changes to 9:30 PM to 11:00 PM. Therefore, the time slot objects 305A, 305B and 305C in FIG. 4 indicate 9:30, 10:00, and 10:30, respectively. The next time slot object 334 also changes and indicates 11:00 PM in FIG. 4.

When the image region 304 is active, activations of up or down arrows by a user via a remote control device results in incrementing and decrementing the indicated next time slot. Upon receiving a select command, the video PID including the channel information for the time indicated by the selected next time slot object 334 is retrieved. In the case of that video stream being part of a currently broadcast or currently used video stream (e.g., another user had requested this stream), the head end provides information to the set top terminal enabling the set top terminal to identify the video PID including the appropriate channel guide information. The set top terminal then retrieves the appropriate video PID. If the selected video PID is located in a different transport stream, then the audio PID is also retrieved from the new transport stream.

This process of moving from one program guide page to another is depicted in FIGS. 5A-5C. FIG. 5A depicts a flow diagram 500A illustrating contextual changes in the IPG display screen 300A in response to horizontal increment and decrement (right/left) commands, such as right arrow and left arrow key activations from, e.g., a

remote control. Each of the objects depicted in the contextual flow diagram comprises a video object having associated with it a graphical overlay providing emphasis to indicate an active (i.e., selectable) object or de-emphasis to indicate a non-active object (i.e., non-selectable).

The objects depicted in the flow diagram 500A of FIG. 5A comprise a subset of the objects shown in the IPG display screen 300A of FIG. 3A. Specifically, the objects depicted in the contextual flow diagram 500A of FIG. 5A comprise, in the order of emphasis in response to a right arrow or horizontal increment: the first 305A, second 305B and third 305C time slot objects of the IPG display screen guide region. These objects are followed by the following IPG display screen image region objects: day of week identification object 331, next time slot object 334, "favorites" filter object 335, "movies" filter object 336, a "kids" filter object 337 "sports" filter object 338 and VOD user interface object 338. It should be noted that while the objects depicted in the contextual flow diagram 500A comprise objects depicted in the IPG display screen 300, other IPG display screens may be adapted accordingly.

For purposes of this discussion it is assumed that the first object to be highlighted or emphasized is the first time slot object 305A. Referring to FIG. 5A, in response to a first right arrow or horizontal increment 501, the first time slot object 305A is de-emphasized and the second time slot object 305B is emphasized; in response to a second right arrow or horizontal increment 502, the second time slot object 305B is de-emphasized and the third time slot object 305C is emphasized; in response to a third right arrow or horizontal increment 503, the third time slot object 305C is de-emphasized and the day of week identification object 331 is emphasized, and so on for the (504) next time slot object 334; (505) "favorites"

object 335; (506) "movies" selection object 336; (507) "kids" selection object 337; (508) "sports" selection object 338; (509) "VOD" selection object 436 and, finally, is returned to the (610) first time slot object 305A.

The graphical representation of FIG. 3A is divided into guide region objects (the three timeslots 305A-305C) and image region objects (the remaining objects 331-338). The functionality of vertical increment (up arrow), vertical decrement (down arrow), page up, and page down depends upon which region is activated. The differences between guide region and image region key functionality will be discussed in more detail below with respect to FIGS. 5B and FIGS. 5C.

When the guide region is active (any of objects 305A-305C emphasized), the up and down arrow keys are used to scroll through the various portions of the guide region. That is, the channel content object number (310-1 through 310-8) is changed by one (i.e., incremented or decremented) in response to up arrow or down arrow activation. Similarly, the displayed video stream is changed (via selecting the next or prior video PID) in response to page up or page down key activation. Thus, active guide region functionality provides for navigation of the various video streams providing broadcast IPG screens to a user.

When the image region is active (any of objects 331-338 emphasized), the up and down arrow keys are used to change the next time slot object 334, while the page up and page down keys are used to change the day of week identification object 331. Specifically in response to an up arrow key activation, the next time slot object 334 is incremented by, e.g., 1.5 hours by selecting the video PID including the guide information for the next three time slot objects of the current channels presented in the guide region. Similarly, in response to a page up key

activation, the day of week identification object 331 is incremented by 1 day by selecting the video PID including the guide information for the next day of the current channels presented in the guide region.

FIG. 5B depicts a contextual flow diagram to illustrate the changes in the IPG display screen 300A in response to vertical increment and decrement (up/down) commands received while a guide region object is highlighted or emphasized.

The objects depicted in the contextual flow diagram 500B of FIG. 5B comprise a subset of the objects shown in the IPG display screen 300 of FIG. 3. Specifically, the objects depicted in the contextual flow diagram 500B of FIG. 5B comprise the channel content object 310-1 through 310-8 as indicated by the channel indicator objects 341A and/or 341B. In response to successive down arrow or vertical decrement key activations, the indicated channel content object traverses from 310-1 to 310-2 (520); 310-2 to 310-3 (521); 310-3 to 310-4 (522); 310-4 to 310-5 (523); 310-5 to 310-6 (524); 310-6 to 310-7 (525) and 310-7 to 310-8 (526). Similarly, activating an up arrow or vertical increment key changes the indicated channel in the reverse order.

In response to a down arrow activation while channel object 310-8 is indicated, the "next" video PID is selected for display. That is, the video PID containing the next eight channels to be displayed for the currently viewed time slot is selected. If the last eight channels are presently being displayed, then the video PID associated with the first eight channels is selected (i.e., channel "roll-over"). In the case of the "next" video PID being part of a different transport stream, the related transport stream is retrieved and the appropriate video PID and the associated audio and data PIDs are extracted.

In response to an up arrow activation while channel object 310-1 is indicated, the "prior" video PID is selected for display. That is, the video PID containing the prior eight channels to be displayed for the currently viewed time slot is selected. If the first eight channels are presently being displayed, than the video PID associated with the last eight channels is selected (i.e., channel "roll-under") In the case of the "prior" video PID being part of a different transport stream, the related transport stream is retrieved and the appropriate video PID and the associated audio and data PIDs are extracted.

FIG. 5C depicts a contextual flow diagram to illustrate the changes in the IPG display screen 300A in response to vertical increment and decrement (up/down) commands received while an image region object is highlighted or emphasized.

The object depicted in the contextual flow diagram 500C of FIG. 5C comprises the next time slot object 334 shown in the IPG display screen 300A of FIG. 3A. Specifically, when an image region object is activated, the next time slot object 334 is incremented or decremented in response to, respectively, an up arrow or vertical increment key activation and a down arrow or vertical decrement key activation. In the exemplary embodiment, the next time slot object 334 is delineated in 1.5 hour intervals (i.e., the time slot following the three time slots 305A, 305B and 305C of the guide region) for a 24 hour period.

In one embodiment of the invention, the operations described in the contextual flow diagram 5C only occur if the next time slot object 334 or a combined object comprising the day object 331 and next time slot object 334 are highlighted or emphasized. In another embodiment of the invention, the operations described in the

contextual flow diagram 5C occur when any image regions object is highlighted or emphasized.

In response to successive up arrow or vertical increment key activations, the indicated next time slot object traverses from the actual (with respect to the present time) next time slot (551) to a next time slot + 3 (552) via path 5512; a next time slot + 6 (553) via path 5523; a next time slot + 9 (554) via path 5534 and so on up to a next time slot + 21 (558) via path 5578. An additional up arrow or vertical increment key activation results, in the present embodiment, in a return to the next time slot (551) via path 5581. Similarly, activating a down arrow or vertical decrement key changes the indicated next time slot object in the reverse manner, except for one case. Specifically, in the case of activating a down arrow or vertical decrement key when the next time slot (551) is indicated, the system enters a time shift mode 556 via path 5516.

FIG. 6A depicts a second embodiment of a user interface in accordance with the present invention. The first time slot 305A is emphasized and that only the first title object 311A within each of the channel content objects 310 is shown. That is, only the title object associated with the emphasized time slot is "revealed," while the title objects associated with the non-emphasized time slots are "masked." This "mask and reveal" method of presentation provides an IPG display that some viewers find more desirable than the previously described (with respect to FIGs. 3A-3C) muting or reduced opacity de-emphasis method of presentation. However, the muting or reduced opacity de-emphasis method of presentation does present more information to the viewer in each IPG display.

Referring simultaneously to FIGS. 6A through 6C, FIG. 6A depicts an IPG display 600A having the first time slot

305A emphasized and each of the title objects 311A associated with the first time slot being revealed, while each of the title objects 311B, 311C associated with the non-emphasized time slots 305B and 305C are masked (hidden). In FIG. 6A, the first time slot object 305A is emphasized, and the second and third time slots 305B and 305C are de-emphasized; in FIG. 6B the second time slot object 305B is emphasized, while the first and third time slot objects 305A and 305C are de-emphasized; and in FIG. 6C the third time slot object 305C is emphasized while the first and second time slot objects 305A and 305B are de-emphasized. Note that in all cases the operation of the title description object 350 remains unchanged, as does the operation of the video barker 320 and all the other functional elements of the program guide. By using the mask and reveal technique, the irrelevant information in the IPG is effectively removed to simplify the user interface. When the user has previously defined certain programs as favorites, the subsequent selection of the "favorites" icon 335 masks all non-favorite programming. Similarly, selecting the "sports" icon 338 masks all non-sports programming.

FIGS. 7A and 7B together as FIG. 7 comprise a user interaction method 700 according to the invention. FIG. 7B also depicts a diagram representing an alignment between FIG. 7A and FIG. 7B. FIG. 7 depicts a user interaction routine 700 according to the invention. The routine 700 is entered at step 702, when the subscriber equipment is initially powered on or initialized. The routine then proceeds to step 704, the first or default stream is tuned and demodulated. The routine 700 then proceeds to step 706, the first or default video stream and associate audio stream is demultiplexed and displayed. The routine 700 then proceeds to step 708, where an appropriate overlay is retrieved and displayed along with

the displayed or presented video stream. The routine 700 then proceeds to step 710, where the STT waits for user input via, e.g., remote control device 280. Upon receipt of user input, the routine proceeds to step 712 to evaluate the input. The routine 700 then proceeds to step 714, where a query is made as to whether the user interaction abstraction level is contextual, i.e., the contextual IPG changes that requires information to be sent from head end or local/contextual that carries interaction processes both locally at STT and request information from head end.

If the query at step 714 indicates that a contextual change is requested by the viewer, then the method 700 proceeds to step 716, where a query is made for the pressed key type. If a RETURN key is pressed, the algorithm proceeds to 718, where the system reacquires the previous context. For example, the viewer may have previously been viewing a movie preview and, at the end of the preview, the viewer has been returned to the IPG context. If the viewer then presses the RETURN key, he or she is returned to the previous context and the movie preview is re-displayed. At the end of the requested context presentation, the method 700 returns to step 710.

If, at step 716, the viewer presses a SELECT key to select a presently emphasized or highlighted object, the method 700 proceeds to step 720 where the context is identified as being changed. At step 722, the new context functions are performed. For example, the user may have highlighted and then selected the "video-on-demand" icon. Such a selection will cause the system to enter the video-on-demand (VOD) context. In this context, the STT is sent a VOD navigator in a pointcast manner to enable the user to select a movie to view. Other context changes result when the viewer selects the video barker, any of the programs in the guide region of the IPG display, and the

like. Barker selection causes the system to enter a barker defined context, i.e., a movie, if the barker was displaying a movie preview; a sales page, if the barker was advertising a product; and so on. The selection of a program available for viewing in the current time frame causes the system to send the program video to the STT's either as pointcast or broadcast stream. The stream type depends upon the program selection. The selection of a program listed in an upcoming time slot results in display of a preview of the selected program.

It should be noted that in one embodiment of the invention, the head end causes multiple STTs to "share" a pointcast stream. That is, if a first STT request a video stream that is currently being provided to a second STT, the head end will guide the first STT to the PID and (optionally) transport stream providing the video stream to the second STT. If the second STT indicates to the head end that it is finished viewing the video stream, the head end determines if another STT (i.e., the first STT) is still utilizing the video stream. If the stream is still being utilized, the pointcast session is not torn down (at least not with respect to the STT(s) utilizing the video stream). In this manner, forward channel bandwidth and head end video processing resources are conserved.

Sharing of pointcast streams is especially useful within the IPG display context where relatively low channel depth and/or time depth is used. In such a case, it is quite likely that several users will want to contemporaneously view information that may be packaged within the same video stream. Thus, an adaptive narrowcast (or group pointcast) system is provided, wherein the head end is able to adapt resource allocation to the sub-set of users exhibiting a coordinated need for information. These adaptive narrowcast session are

created and torn down as necessary in response to changing user demand. In the event of a very high level of utilization streams associated with a particular channel group(s) or time slots, the head end may determine that the processing, memory and bandwidth resources required to create, manage and tear down the narrowcast of such streams is greater than the resources required to simply provide such streams as broadcast streams. in one embodiment of the invention the head end will adapt the depth of the broadcast stream to accommodate the high utilization stream(s). This accommodation does not require the addition of contiguous channel groups or time slots, only the addition of PIDs allocate to the high utilization stream(s).

If the query at step 714 indicates that local interactivity is requested by the user, then the method 700 proceeds to step 740, where a query is made to identify the type of key pressed by the user. If the query at step 740 indicates that a freeze key has been pressed, then the method 700 proceeds to step 734, where the video frame presently stored in the frame store unit 262 is frozen. That is, the frame store unit 262 is not updated by subsequent video frames until such time as a freeze key or other key is pressed. The method 700 then proceeds to step 710, where the processor waits for user input.

If the query at step 714 indicates that one of an increment or decrement key has been pressed (e.g., a channel indication increment or decrement command), then the method proceeds to step 744. If the query at step 740 indicates that one of the page up or page down keys has been depressed, then the method 700 proceeds to step 742.

At step 742, a query is made to determine whether the page up key has been pressed. If this is the case, then the method 700 proceeds to step 732. Then, a query is

made at step 732 to determine whether the PID being viewed is the first PID in the transport stream. If this is the case, then, depending on the organization of the video PID's in a single or multiple transport streams, either it is tuned to the previous broadcast stream or it is wrapped around to the last video PID in the same transport stream. If the query at step 732 reveals that the PID is being viewed is not the first PID in the transport stream, then the previous video PID in the same transport stream is demultiplexed and displayed. If the query at 742 indicates that a page down key has been pressed, then the method 700 proceeds to step 726. Then, a query is made at step 726 to determine whether the PID being viewed is the last PID in the transport stream. If this is the case, then, depending on the organization of video PID's in a single or multiple transport streams, either it is tuned to next broadcast transport stream or it is wrapped around to the first video PID in the same transport stream. If the query at step 726 reveals that the PID being viewed is not the last PID in the transport stream, then the next video PID in the same transport stream is demultiplexed and displayed.

At step 744 a query is made as to whether an increment key has been pressed. If the query at step 744 is answered affirmatively, then the method 700 proceeds to step 746. If the query at step 744 is answered negatively (i.e., a decrement key has been pressed), then the method 700 proceeds to step 748.

At step 746, a query is made as to whether the upper most channel of the program guide (i.e., channel content object 310-1) is presently indicated by channel icons 341A and 341B. If the query at step 746 is answered affirmatively, then the method 700 proceeds to step 732 and continues as described above with respect to step 732.

If the query at step 746 is answered negatively, then the method 700 proceeds to step 750.

At step 750 a query is made as to whether an upper threshold level has been reached. An upper threshold level is a pre-set channel number (in the group of channels of an IPG page) at which a request for a prior channel PID should be made if such a prior channel PID is unavailable. If the query at step 750 is affirmatively answered, then the method 700 proceeds to step 754. If the query at step 750 is negatively answered, then the method 700 proceeds to step 758.

At step 754, a determination is made as to whether the prior channel group is available. An available channel group is a channel group within a video stream that is presently being broadcast or narrow cast or pointcast to one or more set top terminals. As previously noted, the set top terminal receives information associating each channel group with a particular video stream as identified by a unique PID. If the unique PID, or the stream associated with the unique PID is not being broadcast, narrow cast or pointcast, then it is appropriate at this time to request that the head end begin a pointcast session so that the prior channel group can be received by the set top terminal without undue delay (e.g., without the user experiencing latency due to the amount of time required to process and respond to a request for a video stream). If the query at step 754 is answered negatively, then the method 700 proceeds to step 756, where a request for the prior channel group is sent to the head end for processing. The method then proceeds to step 756. If the query at step 754 is answered affirmatively, then the method proceeds to 758.

At step 758, the channel indicator is moved up by one channel content object 310. That is, the channel content object immediately above the presently indicated channel

content object is now indicated. The method 700 then proceeds to step 710, to wait for the next user input.

If the query at step 744 is negatively answered, then the method 700 then proceeds to 748. At step 748, a query is made as to whether the presently indicated channel is the last lower channel. That is, a query is made as to whether the presently indicated channel is channel content object 310-8, in FIG. 3A. If the query at step 748 is answered affirmatively, then the method 700 proceeds to step 726. It is important to note that if the presently indicated channel is associated with channel content object 310-8, then a decrement command, as noted above with respect to FIG. 5B and path 532 requires the selection of the next channel PID to display the upper most channel of the next channel group (i.e., channel content object 310-1 of the next channel group). If the query at step 748 is answered negatively, then the method 700 precedes to step 760.

At step 760 a query is made as to whether a lower threshold has been reached. If the query at step 760 is answered negatively, then the method 700 proceeds to step 768. If the query at step 760 is answered affirmatively, then the method 700 proceeds to step 762.

At step 762 a determination is made if the next channel group is available. This is, in a manner similar to that described above with respect to step 752, a determination is made if a presently broadcast, narrowcast or pointcast stream includes an IPG guide display including information related to the next channel group. The method 700 then proceeds to step 764.

At step 764 a query is made as to whether the next channel group is in fact available. If the query at step 764 is answered affirmatively, then the method 700 proceeds to step 768. If the query at step 764 is

answered negatively, then the method 700 proceeds to step 766.

At step 766, a request is made by the set top terminal to the head end for the head end to send information associated with the next channel group (i.e., the guide and image portions of the IPG display including the next channel group, or alternatively, a previously stored video screen including the appropriate information). As previously noted, by requesting such information at this point the apparent latency of the system, as experienced by the user, is greatly reduced. The method 700 then proceeds to step 768.

At step 768 channel icons 341A and 341B are decremented or moved down by one channel content object 310. The method 700 then proceeds to step 710, where it waits for user input.

FIG. 8 depicts third embodiment of an interactive program guide (IPG) 800 according to the invention. Specifically, the exemplary interactive program guide screen 800 comprises a time of day/date (TOD) indicator 805, a promotional "splash" icon 810, a cable system or provider logo 815, a video barker 820 (and associated audio barker), a program time indicator 825, a channel number indicator 830, a channel identifier (text or logo) 835, a pair of channel display decrement icons 840a and 840b, a pair of channel display increment icons 845a and 845b, a temporal increment icon 848, a temporal decrement icon 847, a program grid 850 and a scrolling promotional banner 855. The interactive program guide display 800 is displayed on a television screen or other video presentation device in, e.g., the home of a subscriber to a cable television or other information distribution system utilizing the interactive electronic program guide.

FIG. 12 depicts a tabular representation of the functions of various keys on an input device, such as a

remote control, during guide region and image region operation. The functions of some of the depicted keys have been described above and, therefore, will not be additionally discussed. Specifically, FIG. 12 depicts the guide region and image region functionality of the increment (up arrow), decrement (down arrow) page up, page down, horizontal increment (move right), horizontal decrement (move left) select and add/remove keys. The Select key is used to select a highlighted or emphasized object to, e.g., enter a different operating mode (image region response) of tune an indicated channel (guide region response). The add/remove key is used to add a presently tuned channel to the list of favorites. If the presently tuned channel is already on the list, then the channel is removed form the list of favorites. Optionally, the viewer is queried as to whether the viewer really intends to remove the channel from the favorites list.

FIG. 8 depicts third embodiment of a display screen of an interactive program guide (IPG) 800 that is formed in a manner similar to that described above with respect to the IPG display 300 of FIG. 3. The primary differences between the IPG displays of FIG. 8 and FIG. 3A are as follows:

1. The IPG display 300 shows only the programs at a specified time interval, such as 8:30 to 9 PM, whereas display 800 shows the complete time interval.
2. The IPG display 300 does not contain grid structure to show the program versus time interval information. It is a completely unique user interface design.

3. The IPG display 800 of FIG. 8 utilizes a program grid 850 to present programming information, whereas the IPG display 300 of FIG. 3A utilizes an enhanced "mask and reveal" technique to present more information to a viewer while reducing the amount of display clutter experienced by the viewer in navigating through the available programming choices. Only the desired programs are shown.
4. the IPG display 300 of FIG. 3A includes a program description object 350 that is used to display, illustratively, a brief textual description of a program occupying a presently indicated time slot of a presently indicated channel.

In addition to these differences, there can be found many other ones to differentiate the two user interfaces. However, the supporting system is designed to produce either of these interfaces.

Upon receiving a "select" entry from the remote control unit, the set top terminal transmits, via a back channel or some other communications path, the information that identifies the selected object to the head end. It is important to note that, as with the mask and reveal technique, changing the emphasis of an object or element is performed entirely at a local level within the STT. That is, there is no change in the actual video information transmitted by the head end to the subscriber. Only the graphical overlay layer on the display is changed within the STT to facilitate object emphasis.

The interactive program guide display 800 (i.e., the video layer provided by the head end) depicts a program offering of 10 channels within a 1.5 hour time interval. Since there are 24 hours in a day, 16 video streams (each representing one program guide screen) are required to depict 24 hours of program offerings of 10 channels. These 16 video streams may be included within a single

transport stream. Thus, a user desiring to view the next 1.5 hour time interval (e.g., 9:30 - 11:00) may activate a "scroll right" object (or move the joystick to the right when a program within the program grid 850 occupies the final displayed time interval). Such activation will result in the controller of the STT noting that a new time interval is desired. The digital video stream corresponding to the new time interval will then be decoded and displayed, i.e., the STT selects the bitstream within the transport stream that represents the desired program guide and decodes that bitstream. The process for selecting and decoding a bitstream is accomplished in the same manner as described above.

FIGS. 10 and 11 are graphical depictions of two different program guide layout formats. FIG. 10 depicts a program guide screen comprising a horizontally disposed guide region 1010 occupying a large portion of a lower half of the IPG screen 1001, and a video barker or image portion 1020 occupying a portion of the top half of the screen 1001. FIG. 11 depicts a program guide screen comprising a horizontally disposed guide region 1110 occupying a large portion of a lower half of the IPG screen 1102, and a video barker or image portion 1120 occupying a portion of the top half of the screen 1102.

The foregoing description details three layouts for a user interface, however, any user interface layout that can be produced in a head end as a digital video bitstream and sent to a user is considered to be within the scope of the invention. As a further example, the informational video could be a program that is being watched and the graphical imagery could be an HTML page that is associated with the program. The program video could also be contained in the IPG display such that the viewer can continue watching a program while browsing the IPG for other program scheduling information.

Although various embodiments which incorporate the teachings of the present invention have been shown and described in detail herein, those skilled in the art can readily devise many other varied embodiments that still incorporate these teachings.